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famous among which is the fearful gorge of the Via Mala, bounded by precipitous rocks rising to a height of 1,500 feet. Just below that famous cleft in the mountains where the river is confined to a bed hardly thirty feet wide the Rhine is joined by two mountain torrents. One is the Una, whose waters are sometimes as black as ink owing to the triturated slate which they hold in suspension. The other is the Albula or White River, which issues from a gorge, hardly less wild than that of the Via Mala. The Rhine, now an imposing river, is rapidly increased in volume by other tributaries, flows through a wide, alluvial plain, and then enters the ancient lake-basin now nearly filled with alluvium, in which it passes on to Lake Constance.

GEOGRAPHICAL RECORD.

AFRICA.

CLIMATE OF EGYPT.—Egypt may be divided climatologically into the following four regions:

1. The North Coast and the Delta.
2. Middle Egypt down to latitude 27° N.
3. Upper Egypt and the Northern Sudan as far south as latitude 18° N.
4. The rest of the Sudan to latitude 5° N. The Red Sea littoral and the country south of latitude 10° form two divisions.

The first region depends for its climate on proximity to the Mediterranean, and is much affected by the storms of that sea. The prevailing wind is the northeast trade, which here blows rather from the northwest. Storms passing to the north bring south winds, followed by comparatively abundant rain in winter and spring.

The second region forms a transition belt between the first and third. It is near enough to the Mediterranean to feel the influence of the prevailing weather there, but is chiefly influenced by the presence of the desert on both sides.

The third region is beyond the influence of the Mediterranean weather, and is entirely controlled by its proximity to the desert. The northeast trade blows uniformly all the year, and south winds are almost unknown. Rain is limited to occasional falls in thunderstorms.

The fourth region is affected in summer by the monsoon of northeast Africa, but for the rest of the year lies in the belt of the northeast trades. It thus suffers a regular seasonal alteration of weather, dry northerly winds prevailing for rather more than half the year, while moist southerly winds, accompanied by copious rain, blow for the remaining portion.—(*Survey Dept. Egypt. Met. Rept. 1904, Pt. II.*)

R. DEC. W.

LONG-RANGE FORECASTS FOR SOUTH AFRICA.—Mr. D. E. Hutchins, Conservator of Forests for South Africa, has made a careful study of the rainfall

records of South Africa with a view to determining a periodicity in the rainfall. Three cycles have been considered—the solar, of 11 years; (2) the Brückner, of 35 years; (3) a storm cycle, of 9.5 years and a Meldrum cycle, of 12.5 years. Mr. Hutchins recognized these cycles in 1888, and predicted the rainfall of that year by means of them. Since then they have, with few failures, agreed with the rainfall of subsequent years. He concludes that (1) the three main weather cycles are of general application east and west beyond their areas of maximum influence; (2) on going northward the heavier rainfall occurs a season earlier; (3) there are obscure indications of a tendency to rain at the sunspot minimum, but the normal minima have so frequently coincided with the other cycles that the exact influence of the sunspot minimum is difficult to trace, and further observations are necessary; (4) up to the present time the direct influence of the Brückner 35-year cycle is inappreciable in South African weather.

R. DEC. W.

THE OKAPI ON THE WELLE-MAKUA.—In his recent journey across Northern Nigeria and the northeastern part of the Congo Free State, Lieutenant Boyd Alexander heard rumours of the existence of the okapi near Angu on the Welle-Makua, about 500 miles to the west and north of the region, where it had earlier been found in the eastern edge of the Congo forest. The animal is well known to the natives around Angu, but this is the only region near the Welle-Makua where it is met with.

Alexander's party spent three weeks in the effort to obtain a live specimen. The Portuguese collector, José Lopes, followed a solitary okapi for three successive mornings near a stream. He observed that on leaving the water the okapi always took the same course between two large trees about 100 yards from the stream. In his address before the Royal Geographical Society (*Geog. Jour.*, Aug., 1907) Alexander says that José, with the help of natives, dug a pit between the trees and carefully concealed it with branches and leaves. Early next morning he approached the stream and heard the okapi running away. The animal, taking its usual course, fell into the pit and was secured. It was impossible, however, to keep it alive. In the terrible struggle to reach the Nile most of the collections had to be thrown away; but Alexander clung to his beautiful okapi skin, which is being mounted and will be on exhibition at the Natural History Museum, London.

Alexander says that they found the haunts of the okapi along small streams running through swampy grounds and thickly overgrown with a clean-stemmed plant some six to eight feet in height, the young shoots of which are an essential food of the animal. Here it roams about singly or in pairs, and, according to the native hunters, three are occasionally found together.

Captain Gosling of the party managed to get near to the okapi on three occasions, but it was so perfectly concealed among leaves that he did not catch a glimpse of it. During the night the okapi wanders along in the mud and water in search of the young shoots of its favourite plant. It may be found feeding as late as 8 A.M., after which it retires to the seclusion of the forest and remains until dusk. Owing to the thick leaves and the forest, the restless nature and keen hearing of the animal, even the natives find it difficult to track it, and are obliged to resort to trapping. They regard the animal as a mysterious creature, and say that it is always moving and never lies down to sleep. The observations of José Lopes seem to confirm this assumption to some extent. On

several occasions when he heard it feeding, it simply paused to take a leaf here and there and then passed on again.

Sir Ray Lankester, discussing Alexander's paper, expressed the opinion that this region is probably the extreme western and northern range of the okapi. The skin which Alexander brought home, he said, differs from that which was brought by Sir Harry Johnston from the Semliki River, being of a very much darker colour and with stripes more numerous and of a creamy white rather than pure white. There are also features about the skull and the tufts of hair at the tail in which it differs from the first specimen. Nearly every specimen of okapi, in fact, which has been brought to Europe differs greatly from every other. Prof. Sir Ray Lankester said that it was one of the most variable animals that had come under his observation. He is examining, as far as he can, all the skins and skulls of the okapi that have been brought to Europe. He has studied thus far some twelve of the twenty specimens in Europe, and hopes eventually to be able to say something definite on the subject of this animal.

When Sir Harry Johnston brought the first specimen to Europe, it was classified as a new genus of *giraffidae*. In his "Uganda," Sir Harry Johnston said that, as far as was known in 1902, the okapi was confined to the northern part of the Congo forest near the Semliki River. Alexander's find, however, was far to the west. The okapi and the giraffe, it is thought, may be the two surviving forms of giraffe-like animals of which fossil remains have been found in Lower Egypt, Arabia, India, Greece, Asia Minor, and southern Europe.

Several allusions in earlier writings to a mysterious animal doubtless refer to the okapi. Passages in the early Dutch and Portuguese writers, for example, tell of a strange horse-like animal of unusual markings in black-and-white existing in the depths of the equatorial forests; and Stanley printed a note in "Darkest Africa" saying that the Congo dwarfs know an animal of horse-like appearance in their forests which they catch in pitfalls.

AMERICA.

THE GEOGRAPHY OF BOLIVIA.—At the end of September Mr. Isaiah Bowman, Instructor in Geography at Yale University, returned from an expedition to northern Chili and Bolivia. Realizing the importance of genuine geographic research as distinguished from mere travel, and feeling especial interest in South America, the authorities of Yale last spring gave Mr. Bowman six months' leave of absence for the prosecution of this work. Sailing by way of Panama, Mr. Bowman, accompanied by Mr. R. L. Rogers, reached Iquique in northern Chili during the latter half of April. Thence by rail and caravans the travellers went inland across the coastal pampa and over the western ranges of the Andes to the western border of the great lake which formerly filled the central basin of Bolivia, parts of which are now occupied by Lakes Titicaca and Poopó. They came back to the coastal region by a more southerly route, and after studying the great nitrate deposits which have been the cause of so much quarrelling between Peru and Chili, went south along the coast to Antofagasta. Taking the railroad at that point they once more crossed the western ranges into the great central basin. Here they made numerous excursions to the old shores of the lake near the railway, and into and across the eastern Andes. One such excursion was to Cochabamba and another to the eastern base of the Andes, where the upper waters of the Mamoré, a tributary of the Madeira

River, emerge upon the vast eastern plain of South America, over 1,600 miles from the sea, and only about 700 feet above it. Northwest of Lake Titicaca Mr. Bowman and his companion went on to old Cuzco, and then returned to the sea at Mollendo by way of Arequipa for the voyage home.

The specific object of the journey was the description of a certain portion of South America according to a definite geographic plan which involved the constant correlation of the physical features of the country with the habits, occupations, and character of the people. For instance, the presence of the nitrate deposits explains various unusual phases of human activity ranging all the way from the distribution of villages to the mode of life of the people and the politics of Chili, Bolivia, and Peru. Among the more purely physiographic problems studied by Mr. Bowman the most interesting are the plateau-structure of the region, which is plainly evident even among the highest mountains; the extent of ancient glaciers, the expansion of former lakes, and the evidence of changes of climate since the occupation of the country by man. E. H.

SNOW-LINE, GLACIERS AND CLIMATE IN THE ANDES OF ECUADOR.—Dr. Hans Meyer has recently made a study of the snow-line, of the height above sea-level of the glaciers, and of the general climatic conditions of the Andes of Ecuador (*In den Hochanden von Ecuador*, Berlin, 1907), the immediate object of his trip being the investigation of the present conditions of snow and ice, and of the evidence of former more extended glaciation. Wilhelm Reiss, thirty years ago, determined the height of the snow-line on the Eastern Cordilleras as 4,620 meters, on the Western Cordilleras as 4,720 meters, and the mean for both ranges as 4,670 meters. Meyer shows that within the last thirty years the snow-line is at least 50 meters higher, so that the present height is about 4,700 meters and 4,800 meters on the two ranges. The average limit of glaciers twenty-five years ago was about 300 meters below the snow-line; now it is only 200 meters below the snow-line. The mean height above sea-level of snowfalls is 3,700 meters. Within the last thirty years the glaciers have retreated about 150 meters, and are still retreating. In the glacial period the glaciers extended down to about 3,800-3,700 meters, or 800-900 meters lower. That was a time of more abundant precipitation, and also of lower temperature (for Ecuador, about 5.5° lower).

On the west side of Cotopaxi the last cultivation of the soil (potatoes) was found at 3,765 meters. On the north side the highest habitations are at 4,266 meters. The Ecuadorian Andes are under the control of the easterly trade winds. The cirrus clouds move about the high plateau steadily from east to west. The Western Cordilleras alone have westerly winds during the day. These winds rise from the warmed Pacific lowlands and often reach up to the highest mountain summits, being replaced at night by easterly winds. Thunderstorms and rains come with easterly winds. In the dry season (*verano*) the clouds are driven across the Eastern Cordilleras and on to the inter-Andine plateau, where they are soon dissolved by the warm, ascending air. The broken clouds rise rapidly, under the control of the stormy trades, drifting across the plateau, and giving light showers (*paramitos*), apparently from a clear sky. The vapour condenses again on the Western Cordilleras, forming cloud-banks, which dissolve again over the western slopes. The cloud from the volcano Sangay (5,320 meters, Eastern Cordilleras) is carried by the trade winds off toward the west, like the smoke from a locomotive. From this smoke there is a steady fall of ashes over the plateau. The smoke cloud itself reaches a height of 5.5-8.5 miles. The smoke column from Cotopaxi during violent eruptions has been estimated and

measured at a height of 8.5 miles (five miles above the crater). The volcanoes are often capped with clouds.

Regarding the climate of Quito, Dr. Meyer says that it is characterized by burning sunshine during the day. There is a sudden cooling under cloud-shadows. Frequent rain squalls, with hail, even with snowflakes, are notable features. It is a climate of "colds." Everybody coughs. In the evenings a winter overcoat is the most comfortable garment. Meyer finds the principal cause of *soroche* (mountain sickness) in the decrease in the supply of oxygen in consequence of the rarity of the air. *Soroche* was experienced at night and especially above 5,000 meters.—(*Abstracted and translated from Met. Zeitschr., May, 1907.*)

R. DEC. W.

ASIA.

THE HEJAZ RAILWAY TO MECCA.—The survey work of the Hejaz railway from Medina northward having been completed for a considerable distance, the actual work of construction has now begun on this section of the road. Ties, rails, and all other materials are imported to Yembo, on the Red Sea, whence they are carried on camels to sacred Medina. The Sultan, with customary ignorance of geographic conditions, has prohibited the sale of Government lands along the proposed line. He has ordered them to be reserved for the settlement of immigrants, to whom they will be leased for a nominal rental. Urgent orders have also been issued in regard to the planting of trees all along the line. It is said that, as a result of the Sultan's interest in the railroad, private land-owners along the proposed course are reaping a rich harvest from the sale of their lands. Prices have risen marvellously. It is to be feared that the Sultan and the buyers will be greatly disappointed. Few parts of the world are drier and less inviting than northern Arabia. The projected restoration and repair of the Jubeda canal and other old waterways, both natural and artificial, will doubtless be a great boon to the country. Nevertheless, little can be expected of them; for canals are useless without water. The few travellers who have visited this part of the world agree in describing it as almost insufferably hot, and as furnished with only the most scanty supply of water, most of which is brackish. Formerly, if we may judge by the great number of ruins, the supply was greater. The natives, as Doughty, among others, records, believe that there are great numbers of lost springs which the European by his strange arts can cause to flow again. It is these which the Sultan probably hopes to reopen.

The difficulties attendant upon the construction of the pilgrim railroad from Damascus to Mecca are much greater than is usually realized. They spring not only from the physical obstacles to be overcome, but from the well-known tendency of the Turkish officials to "eat" the money committed to their charge, and from the warlike tendencies of the Arabs. For years the ill-fed, poverty-stricken nomads of northern Arabia—the part known as the Syrian Desert—have been intermittently at war with the Turks, their nominal masters. The same is true of the people of Yemen, the part of "Fortunate Arabia" south of Mecca. At present a Turkish army is trying, as it has tried for a decade, to hold them in check and reduce them definitely to submission to the Porte. Finally the Wahabis, a reformed sect of Mohammedans in central Arabia, are on the war-path. In June one of their leaders from Nejd, or Upland Arabia, was reported by the Egyptian Gazette to be threatening Medina, the present centre of railway construction. The Turks appear to be unable to cope with both the Arabs.

and the desert. In the winter of 1904-5, Achmet Faizi Pasha, with ten battalions of Turkish troops, made a remarkable journey from Meshed Ali, near Bagdad, to the Wahabi capital of Hayil, in the centre of northern Arabia. Thence, undaunted by heat and fatigue, he marched across the desert to Medina and Mecca, which he reached in May. In the fall of 1905 he marched upon Sana, farther south in Yemen. Heat, thirst, poor food, and lack of proper clothing caused terrible distress and sickness among the troops. Those who returned home brought such fearful accounts of their hardships that to-day the Turkish Government finds it almost impossible to procure recruits for Arabia. Men flee to the mountains or suffer fines and imprisonment rather than go to a land where they expect to perish. All undertakings in Arabia, whether railroads or military movements, meet almost unparalleled obstacles in the adverse geographic conditions. E. H.

PHILIPPINE ETHNOLOGICAL PAPERS.—The Philippine *Journal of Science* is printing a series of articles on Philippine ethnological and ethnographical subjects which will be of fundamental importance to all who are interested in the peoples of the Philippine Islands. The first article, "The non-Christian Tribes of Northern Luzon," by Dean C. Worcester, appeared in the number for October, 1906 (Vol. 1, No. 8).

The author refers to the confusion as to the classification and geographical distribution of the non-Christian tribes in this area, discusses three of the latest and most authoritative classifications—by Prof. Blumentritt in 1882, who recognized 24 tribes; by the priests of the Jesuit mission of Manila, who in 1899 enumerated 36 tribes; and by Dr. David P. Barrows, who showed that in earlier classifications a superlative number of designations had been given to what are practically identical people, many groups being designated as tribes simply because they had dialects more or less peculiar to themselves. Barrows divides the non-Christian tribes into the Negrito and Malay races, the Negrito forming only one tribe and the Malay three tribes—the Igorot (divided into twelve dialect groups), the Ilongot, and the Bukidnon.

Worcester recognizes the following tribes in northern Luzon:

I—the Negritos; II—the Ilongots (Ibilaos); III—the Kalingas; IV—the Ifugaos; V—the Bontoc Igorots; VI—the Lepanto-Benguet Igorots; VII—the Tingians.

He describes each of these tribes, giving its habitat and a brief account of the physical characteristics of its members, their dress, ornamentation, settlements, hunting, fishing, agriculture, manufactures, methods of warfare and head hunting, weapons, music and dancing, marriage customs and customs relating to the burial of the dead. He does not discuss folklore or religious beliefs. A large number of photographs of individuals, groups, huts, settlements, fields, industries, handiwork, dances, etc., illustrate the paper.

SAKHALIN ISLAND.—Mr. Max Funke has put into pamphlet form the results of his studies of Sakhalin, and it has been issued in the series of studies in applied geography by the Gebauer-Schwetschke publishing house at Halle on Saale under the title "Die Insel Sachalin." It is a concise, clearly-written and well-arranged treatment of the geography, geology, ethnography, industries, and inhabitants of the island, giving, in 33 pages, a comprehensive, if not detailed, account of the subject. A list of works on Sakhalin, many of them in Russian, is appended.

EXPLORATION IN THE HIMALAYAS.—It will be remembered that the British Government recently denied the request, preferred in behalf of an expedition to

be led by Dr. T. Longstaff, for permission to travel through the southern edge of Tibet in order to reach a favourable place for a proposed attempt to ascend Mount Everest. Thus defeated in his plan, Dr. Longstaff, Col. Bruce, and Mr. Mumm, with the Brocherel brothers, Alpine guides, went to the Garhwal Himalayas to climb a number of the summits. On June 12, the party ascended Trisul, which has a height, according to the Indian Trigonometrical Survey, of 23,406 feet. This is believed to be the highest elevation yet attained by man. At 8.30 A.M. the party left the camp, elevation 16,750 feet, reached the summit at 4 P. M., and were back in camp 3 hours later. The going was steep but easy, on about six inches of snow. It was very cold, and the wind whipped up the snow and drove it through the clothing of the men.

PROGRESS IN TIBET.—The "Returns of Trade" of the Chinese Maritime Customs for 1906 contain some general remarks on conditions in Tibet (pp. 557-8). A British trade representative has for two years been stationed at Gyangtse in Central Tibet. The roads in the interior have been so far improved that the British trade agent in January last was able to drive two motor cars between Phari on the frontier and Gyangtse. Chinese trade representatives have been appointed to the three marts open in Tibet to foreign trade. The imports and exports, however, only amounted to about \$750,000. It cannot be expected that the resources of such a country will largely increase unless the mineral wealth of the land, which is reputed to be considerable, is exploited. There are large tracts of placer and quartz gold fields and turquoise mines as yet undeveloped.

RUSSIAN EXPLORATIONS IN ASIA.—Russian explorers are about to engage in a number of scientific expeditions for the exploration of the Russian possessions in Asia and the neighbouring territories. Particular attention is to be given (*Pet. Mitt.* No. 9, 1907, p. 215) to the study of the minerals of Siberia.

Captain Belinski, with six companions, began a journey at the end of May, which, it is expected, will keep the party in the field for six years. The route lies through Semiryetchensk and Mongolia to the region of the Altai Mountains, thence through the Minusinsk district to Lake Baikal, from Nerchinsk along the Amur in the Trans-Amur region, and finally through the land of the Yakuts to Bering Strait, and across Kamtchatka to Vladivostok. The chief purpose of the expedition is to make an investigation of mineral resources, with a view to further development of mining.

Mining engineer K. N. Tultshinski, late last year, began a preliminary geological reconnaissance in the northern part of Sakhalin. His results will be the basis of a systematic geological investigation of the Russian part of the island. A topographical survey of this region will also be carried out.

The well-known explorer of the Caucasus and the Tian Shan Mountains, Prof. Dr. G. Merzbacher, started on April 17 on a new journey to Central Asia accompanied by Prince Arnulf of Bavaria, who expects to have rare opportunities for hunting, and the geologist Dr. Leuchs. Dr. Merzbacher plans to make further explorations in the Tian Shan, where he has already spent about two years. He expects to return home early next year.

According to the *Athenaeum*, a scientific expedition for the exploration of Central Asia has been organized by the Imperial Russian Geographical Society. It will be under the leadership of Mr. Kozlof, the old comrade of Przhevskii. Kozlof is well known for his own explorations in Mongolia and eastern Tibet.

The expedition will leave this autumn, and proposes to spend two years in the close examination of southern Mongolia and the western parts of the Chinese provinces of Kansu and Szechuen. It is said that the entire cost of the expedition will be borne by the Emperor.

AUSTRALIA.

NORTHERN TERRITORY OF SOUTH AUSTRALIA.—The Society is indebted to the Government of South Australia for ten publications relating to the Northern Territory, the vast region, chiefly tropical, which has large possibilities in its agricultural, grazing, and mineral resources, though as yet its population and development are small. The report of the Government Resident for 1905 deprecates the heavy burden settled upon the inhabitants (about 6,000) of the cost of the railroad between Palmerston and Pine Creek, which was started as a trans-continental line from Port Darwin (Palmerston) to Adelaide, and was never meant to be a burden to the inhabitants of the extreme north, who were saddled with the cost of the construction of this part of the road. The line is conspicuous on our maps as extending from the northern coast to the Pine Creek mining district, a distance of 146 miles.

The report of the Government Geologist in 1905 says that along this railroad from Port Darwin to near the Adelaide River, 74 miles, the country is undulating, open forest, with large kangaroo and other coarse varieties of grass. From the Adelaide River the road passes into the mining region (alluvial gold), and the country is more hilly, with extensive plains and many creeks, some of which are lined with bamboo, giving a picturesque and tropical effect to the landscape. The traveller is impressed with the idea that the country is valuable, and the flat portions seem to consist of good, cultivable soil. Pine Creek consists of a few railroad and business buildings, a good hotel, and post office and telegraph and police stations. All buildings are of galvanized iron, with a few tin and bark shanties. The escarpment forming the edge of the tableland is seen to the south.

There are about 7,400 square miles of metalliferous country in the north-western portion of the Northern Territory, gold, tin, and copper being the principal metals. Some of the gold finds in the past were very rich; but although much work has been done in surface prospecting, there are still considerable areas which have not been carefully studied.

In 1905, the Government sent a prospecting party to the southwestern and western portions of the Northern Territory in charge of Mr. F. R. George, who, unfortunately, contracted a fatal illness before the trip was completed, and the work was then directed by Mr. W. R. Murray. The journal of this expedition, printed this year, shows that the party encountered excessive summer heat in a waterless area and underwent great hardships. The experiences of the party make it clear that attempts to explore the country along the western Australian boundary line in the heat of summer must result in failure. Away from the ranges, useful waters are rare and feed for camels scarce.

The only locality in the Petermann Ranges where gold was discovered was the Foster Cliff, but it was not in paying quantity. Most of that region is alluvial flats and sandhills, eruptive rocks comprising but a small area.

The publications include reports on cotton-growing, by Messrs. J. G. Jenkins and John Bottomley, both of whom speak most favourably of the suitability of the soil and climate of the Northern Territory for the production of cotton. The

frequent reports on this territory which the Government is issuing are establishing the fact that it promises in time to be a valuable tropical colony.

EUROPE.

GEOGRAPHY AT THE BRITISH ASSOCIATION.—The annual meeting of the British Association for the Advancement of Science was held at Leicester, England, during the week beginning July 31. In his presidential address Sir David Gill of Cape Town said that at the cost of The British South African Company the survey of an arc of the meridian has been carried northward to $9^{\circ} 42' S.$ lat., so that there is now continuous triangulation from Cape Agulhas to within 50 miles of the southern end of Lake Tanganyika—that is to say, a continuous geodetic survey has been completed over 25 degrees of latitude.

The papers read in the Geography section were fully up to the standard in number and interest. The address of the President, Mr. G. G. Chisholm, dealt with the relations of geography from an historical, and especially from an economic, point of view. He regards as the greatest feature of modern commerce its promotion of the increase of population nearly all the world over. It has rendered it possible for manufacturing and commercial peoples to depend in very large measure for their means of subsistence on supplies brought from the ends of the earth. It has rapidly pushed the settlement of vacant land to the base of the mountains and the edge of the desert. We are nearing the time when "new lands" in the temperate zone will all have been allotted. The results of such a check to expansion will be momentous, but the nature of these results we are as yet unable to foresee. He was convinced, however, that if we shall become able to make any probable forecast as to the course of future development one of the most important aids must consist in the study of the relations of geography and history from the commercial point of view.

Major C. F. Close, discussing the survey of British Africa, said that there are now properly-organized survey departments in the Anglo-Egyptian Sudan, Uganda, East Africa, Southern Nigeria, and the Gold Coast. In addition, an exact topographical survey is in progress in the Orange River Colony; and in Cape Colony a military reconnaissance survey has been in progress for two and a half years. The annual cost of these surveys is about \$400,000. British Africa has an area of about 2,690,000 square miles, and during the current year about 45,000 square miles will have been topographically surveyed; and to this must be added many compilations, the surveys of boundary commissions and cadastral surveys, such as those in Uganda, where the land holdings of native chiefs are being surveyed on a small scale.

Captain T. T. Behrens read a paper on "The Modern Explorer; his maps and methods," in which he dealt with temperate and tropical conditions of surveying and illustrated the methods of African field work by lantern-slides showing survey operations.

Prof. J. W. Spencer, of the United States, spoke on the recession of Niagara Falls, summarizing the conclusions in his recent monograph and illustrating his remarks by lantern-slides and maps.

Mr. J. D. Rogers read a paper on explorers and colonists, in which he showed that most early explorers were really colonial enthusiasts, whose colonial aims were failures or were carried out long afterwards by persons of a different stamp. Columbus and Cabot were crusaders; Frobisher would have planted a

colony in Baffin Land but for an accident to his store-ship; in the Pacific, Magellan waged holy wars, and Mendaña, Quiros, and Torres founded colonies whose members refused to remain. A second group of explorers in the Pacific consisted of privateers or commercial pioneers who tried to advance war or trade respectively, Roggeween being typical of the first class, Tasman of the second, and Dampier of both. A third class of Pacific explorers included De Bougainville, who took home a Tahitian in order to pave the way for a French-Tahitian Dominion. Cook in his third voyage had two sets of instructions, the secret instructions urging him to annex, with a view to settlement. The foundation of New South Wales was exclusively due to the advice of Cook's travelling companion, Sir Joseph Banks. Probably if these men could have known that posterity would reverse them as explorers they would have felt that history was to throw away the kernel and keep only the husk of what they did. He appealed to writers and students to look more at the ideas behind facts and less at the mere external, accidental results, and to use their imagination as well as their intellect and industry in interpreting history.

THE STUDY OF FRENCH GLACIERS.—The "Service d'études des grandes forces hydrauliques dans la région des Alpes" has as its field of work the region between Switzerland, Italy, the Mediterranean, and the Rhône. It is studying available water-power by means of many gauging stations; also the relation between precipitation and flow-off, the variation of precipitation and, in the more elevated parts of the Alps, the glacial contributions to the rivers. According to Mr. Imbeaux, glaciers between April and August supply about half of the water in the Durance River. To a certain extent the economic value of the lower valley of the Durance River depends in summer upon the glaciers on the Pelvoux *massif*. It is from this river that Marseilles derives its supply of potable water. The Italian engineer Fantoli has demonstrated that in the basins of lakes Como and Maggiore each square kilometer of glaciers produces in summer 650 liters of water a second, while a square kilometer of ordinary land gives only ten to twelve liters a second. It is important, therefore, to have accurate information concerning the extent of glaciers and to study the variations to which they are subject. A number of observers have been detailed to study the glaciers in the French Alps and the Pyrenees.—(*La Géog.*, No. 6, 1907.)

POLAR.

THE ARCTIC CONTINENTAL SHELF.—In the course of the paper which Dr. Nansen read on "North Polar Problems" before the Royal Geographical Society, in April last, he discussed at some length the problem of the Arctic continental shelf. He said in effect that the deep North Polar basin forms the northern termination of a series of depressions of the earth's crust which extend north through the Norwegian sea from the eastern Atlantic and form a dividing line between the continental masses of the Old and New Worlds. The eruption of the Jurassic basalts of Franz Josef Land and Spitzbergen may have had some connection with the sinking of the bottom of the North Polar Sea, but the basin was probably, to a great extent, formed before the outpouring of these basalts. As yet, newer volcanic rocks are not known from the edges of the North Polar basin. De Long reported basalt on Bennett Island, but we do not know its age.

It is most improbable that any block of land (horst) could have remained isolated in the middle of such a basin surrounded by deep water on all sides and

without having any connection with the surrounding lands or continental shelves. It is therefore of great importance to determine where the continental shelf ends, off the known coasts. But the edge of the continental shelf in the North Polar region is only known exactly in two places—to the north-west of the New Siberia Islands and to the north of Spitzbergen, while in the region between these two places we know only the deep sea to the north.

Except in these two places we have little direct knowledge of the limits of the continental shelf. The rule that such shelves are narrower outside high and mountainous coasts than off low, flat lands only holds good where the mountainous formation of the coast is in near relation to its trend, and to the continental slope outside, and also where the coast-line is built of primary rocks. This seems hardly to be the case on the northern coast of the American Archipelago and Greenland, though there are many high promontories in places.

It is possible that along the northern coast of Alaska the necessary conditions are fulfilled, and therefore the shelf may be narrower there; but even this is uncertain. It is possible that the deeper soundings which have been made there may merely indicate the presence of numerous submarine valleys, so that further observations are necessary to delimit the continental shelf in that region. But it cannot be said that the geomorphologic features of the known part of the Arctic regions exclude the possibility of a wide continental shelf, possibly with lands on it, which may extend into some parts of the unknown north.

The marine currents and the ice-drift seem to indicate that there is an extensive tract of sea to the north of the *Fram's* track. Peary's experiences also indicate that there is much sea to the north of Greenland. The ice-drift converges towards the opening between Spitzbergen and Greenland, and Peary's observation of a rapid eastward drift also indicates that there may be much land to the east of his northward track. But as we do not know the depths over which Peary travelled, we cannot say much with regard to the possibility of land or continental shelf farther north and east. The drift of the *Jeannette*, also, did not indicate land to the north.

As sledge journeys do not give sufficient opportunity for soundings and oceanographical work, Dr. Nansen is of the opinion that the best results will be obtained by allowing a ship to drift from the sea north of Bering Strait or western Alaska across the unknown north and towards Greenland. The drift could probably be accomplished in five years.

THE BRITISH SOUTH POLAR EXPEDITION.—Mr. E. H. Shackelton's expedition left England for the Antarctic regions on July 30, sailing in the *Nimrod*, a Newfoundland vessel of 227 tons, adapted to withstand great ice pressure. Mr. Shackelton will join the vessel at Lyttelton, New Zealand, and until then the *Nimrod* is under the command of Lieut. Rupert England, who was second in command of the *Morning* on both her voyages to Antarctic seas in relief of the *Discovery* expedition.

The members of the party on board the *Nimrod* are Mr. James Murray, the biologist; Mr. W. A. Michell, surgeon and zoologist; and Mr. A. F. Mackay, the junior surgeon of the landing party, who will also engage in zoological work. The remaining members of the expedition besides Mr. Shackelton, who are to join the ship at Lyttelton, are Mr. E. Marshall, senior surgeon of the shore party and cartographer; Lieut. Adams, who will be in charge of the meteorological work; and Sir Philip Brocklehurst for survey work and field geology. Dr.

David, professor of geology in Sydney University, has arranged to accompany the expedition south to King Edward VII Land.

VARIOUS.

ECONOMIC GEOLOGY says that the Maryland Geological Survey is preparing, in co-operation with the U. S. Geological Survey, a series of folios which will be published by the latter organization on the scale of one mile to the inch, extending from the Alleghany Plateau to Chesapeake Bay. The object of these folios is largely educational, since they present the sequence of geological formations of the middle Atlantic border from the Archæan to the Pleistocene, and will offer to students the most recent interpretation of the geology of this belt.

DR. ALEXANDER N. WINCHELL, of the Montana State School of Mines, has been elected to fill the Chair of Petrography and Mineralogy formerly held by Prof. William H. Hobbs in the University of Wisconsin.

A MONUMENT is to be erected at Gotha to the memory of August Petermann, the great geographer and cartographer. His name is especially connected with the founding of *Petermanns Mitteilungen*, the promotion of polar research, and the encouragement of German participation in the exploration of Africa.

THE COMMITTEE ON SEISMOLOGY.—The first meeting of the Committee on Seismology of the American Association for the Advancement of Science convened in Washington on April 19. The Committee adopted resolutions to the effect that its functions should be regarded as initiatory and advisory; that the support of the Federal Government in seismological work should be asked; that this work requires the co-operation of the various scientific bureaux of the Government; that the appropriations for seismological stations should be made through the U. S. Weather Bureau, and that the results of the observations should appear in its publications. The Committee was permanently organized by the election of H. F. Reid as chairman and William H. Hobbs secretary. The next meeting is to be held in Chicago in December, during the meeting of the American Association. The members of the Committee are L. A. Bauer, W. W. Campbell, C. E. Dutton, G. K. Gilbert, J. F. Hayford, W. H. Hobbs, L. M. Hoskins, T. A. Jaggar, Otto Klotz, A. C. Lawson, C. F. Marvin, W. J. McGee, H. F. Reid, C. J. Rockwood, Jr., and R. S. Tarr.

CAMBRIDGE UNIVERSITY has conferred the degree of Doctor of Science on Sir Clements R. Markham, formerly President of the Royal Geographical Society; and also on Sir Thomas H. Holdich, known for his geodetic work in India and his writings on India, Abyssinia, South America, etc.

INTERNATIONAL MARINE INVESTIGATIONS.—The Executive Committee of the Swedish Hydrographic-Biological Commission has drawn up a summary of the results so far obtained by the international investigations of the North and adjacent seas. In the course of the report, numerous biological researches are described, but by far the greatest detail is accorded to hydrography. The main result has been the discovery that European seas are flooded every autumn by Atlantic water (of 35 *per mille* salinity or more), which withdraws in spring, and that many fisheries depend on these movements. Such a fishery is that of the Swedish winter herring; the fish is abundant and the fishery prosperous when

southern bank-water, of characteristic salinity, temperature and plankton, forms a thick layer in the Baltic entrances, while in years of exceptional abundance of Atlantic water this displaces the overlying bank-water and a "bad herring year" results. These years occasion considerable distress.

THE NORWEGIAN STORTING has voted 40,000 Kroner to Roald Amundsen in recognition of his services to science in traversing the northwest passage and relocating the magnetic North Pole.

DR. CHARLES DUCHESNE has published a monograph of thirty-four pages with the title "L'Enseignement des Projections cartographiques" which may well be added to "Helps to Teachers." He first treats of the theory of projections as he believes it should be presented to the pupil. He then discusses the eleven projections that are most commonly used, showing to what cartographic purposes each is best adapted, developing their mathematical bases, and explaining the advantages and disadvantages of each of these cartographic methods. The last eleven pages are given to an exposition of what the author regards as the best pedagogic method of presenting these projections to geography classes. He gives lists of maps that may be used for illustrative purposes, and quotes the views of a number of writers on map projections for the criticism of the reader.

The subject is simply, clearly, and concisely presented. The author has endeavoured to adapt his system of instruction to the needs of pupils in the higher grammar or high-school grades. It is certain, at least, that the ideas which he presents are among those which should be taught to students of mathematical geography. The paper has been published in the *Bulletin* of the Royal Geographical Society of Antwerp, and is also issued separately by D. Cormaux, Liège, at 1.50 fr.

ACCLIMATIZATION OF THE WHITE RACE IN THE TROPICS.—Colonel Wm. C. Gorgas, of the United States Army, well known for his splendid work in Havana and in the Panama Canal zone, has recently expressed himself very forcibly regarding the future of the white race in the tropics. His view is extremely optimistic, and is therefore at variance with the generally accepted opinion on this subject. Colonel Gorgas says (address at Cornell University, June, 1907).—"I think that sanitation can now show that any population coming into the tropics can protect itself against disease by measures that are both simple and inexpensive; that life in the tropics for the Anglo-Saxon will be more healthful than in the temperate zones; and that gradually within the next two or three centuries tropical countries, which offer a much greater return for man's labour than the temperate zones, will be settled by the white races, and that again the centres of wealth, civilization and population will be in the tropics, as they were in the dawn of man's history, rather than in the temperate zones, as at present."

In spite of the decreasing danger of contracting the specific so-called "tropical diseases," Anglo-Saxons will continue to find hard outdoor labour under a tropical sun impossible; they will still suffer from the enervating effects of the "hot-house air" of the moist portions of the tropics; they will still be forced to *tolerate* the climate, and not be independent of it. As Benjamin Kidd well said, albeit perhaps in a somewhat too exaggerated way: "In the tropics the white man lives and works only as a diver lives and works under water."

R. DEC. W.

TREES AND LIGHTNING.—In a recent book on *Forest Protection*, by W. R. Fisher, there is a review of the investigations which have been made in Ger-

many and elsewhere, of the liability of trees to be struck by lightning. In the forests of Lippe-Detmold Hess finds (1874-1890) that among broad-leaved trees the oak suffers most, and among conifers the Scots pine. Spruce and beech come next. Birches, poplars, ashes, alders, willows, and other trees suffer only exceptionally. Considering the beech as 1, the danger is 6 for spruce, 37 for Scots pine, and 60 for oak. Hellmann, taking the beech as 1, finds 15 for conifers, 54 for oaks and 40 for other broad-leaved trees. Hess (1896) found that pyramidal poplar is often struck, and in eight out of ten cases he observed lightning passing from the tree to a neighbouring building. According to Collodon, near the lake of Geneva poplars rarely suffer from lightning. Fischer distinguishes between oily trees and starchy trees. The green wood of the oily trees is a bad conductor, while the starchy trees are good conductors. Conifers are intermediate. Starchy trees are more in danger from lightning than oily trees. When sound, well-conducting trees are struck, growing on damp soil, the lightning probably passes rapidly to the earth, without causing much breakage. When rotten wood is encountered, the crown or branches may be broken or the tree may even be set on fire. Observations in the Saxon State forests make it appear that local conditions, such as proximity of lakes, dampness of soil, density of growth, healthy or unhealthy condition of trees, affect the question whether one species or another is more liable to be struck in any particular locality.—(*Quart. Journ., Roy. Met. Soc., July, 1907.*)

R. DEC. W.

IN HIS MESSAGE to the Brazilian Congress on May 3, 1907, President Affonso Penna reported that a geological and mineralogical service had been organized to study the geological structure and mineral resources of Brazil. It will collect and disseminate information in regard to the mineral wealth of the country.

DR. JOHN M. CLARKE, Director of the New York Geological Survey, has gone to Europe to attend the centenary of the Geological Society of London as delegate from the State Survey and from Section E of the American Association for the Advancement of Science. He will also attend the meeting of the Geological Society of Germany in Basel, whence a two-weeks' trip across the Alps will be made under the guidance of the German and Swiss geologists.

THE REDUCTION of the magnetic observations made by Amundsen in the neighbourhood of the North Magnetic Pole is now in progress under the direction of Prof. Mohn and Aksel S. Steen. Amundsen's continuous registrations of the three magnetic elements were made at Gjøa harbour (Nov., 1903, to May, 1905, inclusive) and at King's Point (October, 1905, to March, 1906, inclusive).

THE GEOLOGICAL SURVEY OF ALABAMA, in co-operation with the U. S. Geological Survey, has been engaged since 1898 in the systematic investigation of the water resources of the State. Dr. Eugene A. Smith, State Geologist, has prepared a volume of 388 pages on the results of these investigations, which has been printed by the State Survey. Many well records are given, together with a discussion of the geology of the State, the amount of water available for artesian wells, the movements of underground waters, and a detailed description of underground waters classified by geological horizons. The volume, which is well illustrated by photographs, concludes with a chapter on the chemistry and classification of Alabama waters.

PROFESSOR A. E. VERRILL has just supplemented his preliminary paper on the

geology of the Bermuda Islands, which was published in the *American Journal of Science* (Vol. 9), with the results of his later studies, which fill 278 pp. of the *Transactions* of the Connecticut Academy of Arts and Sciences (Vol. XII). This report gives a more detailed account of the geology and palæontology of the islands and of the Bermuda coral reefs and their characteristic forms of life. The monograph is illustrated by 181 photographs and figures.

NEW MAPS.

AMERICA.

U. S. GEOLOGICAL SURVEY MAPS.

UNITED STATES.—Map of Yosemite Valley. Scale, 1:24,000, or 2,000 feet to an inch. Contour interval, 50 feet. Topography by F. E. Matthes. U. S. Geological Survey, Washington, 1907.

The survey for this map was made by the U. S. Geological Survey in co operation with the State of California. It affords a particularly instructive example of modern detail mapping. Comparison with the standard Yosemite quadrangle, published several years ago, is suggestive. That sheet, on a scale of 1:125,000, or 1.9 statute mile to an inch, well expresses the general character of the sculpturing of the Sierra Nevada. It shows distinctly the glacial sculpture, on the one hand, and the non-glacial on the other. The new detailed map, however, is on a scale so large that it represents a glaciated cañon of exceptional form, with enough detail to shed light on the cause of its aberrant characteristics, which are due to local influences. In other words, the topographer has depicted the Yosemite Valley not merely as a glaciated cañon, but as a glaciated cañon in a region of unusual rock structure. As Mr. Matthes defines the work, "It is a map giving index forms of differential erosion and cliff recession, and it brings out the fact that the aberrant character of the Yosemite topography is intimately linked with the structural vagaries peculiar to the rocks of the Yosemite region."

The area covered is about 70 square miles. It not only shows every waggon road, trail, and house, as on the regular sheet, but the larger scale permits every bend in the roads and every turn in the tourist trails to be indicated.

A part of the survey was made during the fall of 1905, when the Yosemite Falls were entirely dry for two months. The surveying party were therefore able to run a line to the very foot of the Upper Yosemite Fall, where mapping operations are usually precluded by clouds of spray. It was found that the height of the Upper Fall is 1,430 feet; considerably less than the popular estimates.

U. S. HYDROGRAPHIC OFFICE CHARTS.

Pilot Chart of the North Atlantic Ocean, August and September, 1907.

Pilot Chart of the North Pacific Ocean, September and October, 1907.

ALASKA.—Sketch Map of the Glaciers of the Yakutat Bay Region. Scale, 8 statute miles to an inch. By Ralph S. Tarr. *Bull.* 9 of the Geological Society of America, New York, 1907.

The map is based on the Alaska Boundary Tribunal Map. The studies of Tarr